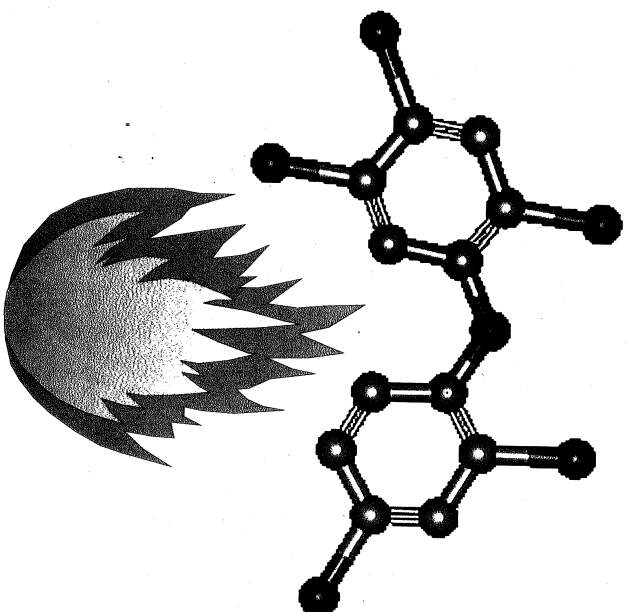
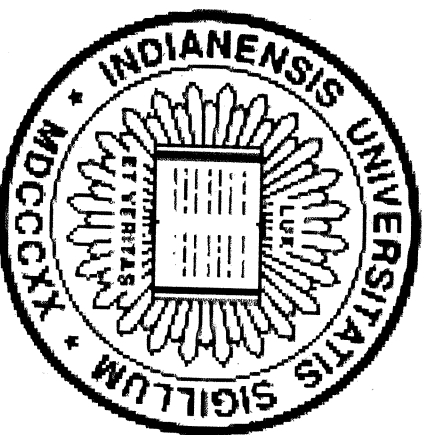


Polybrominated Diphenyl Ethers in People

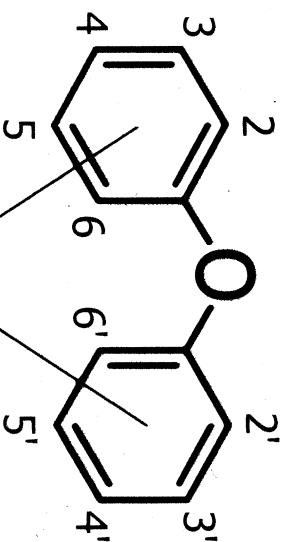


Ronald A. Hites

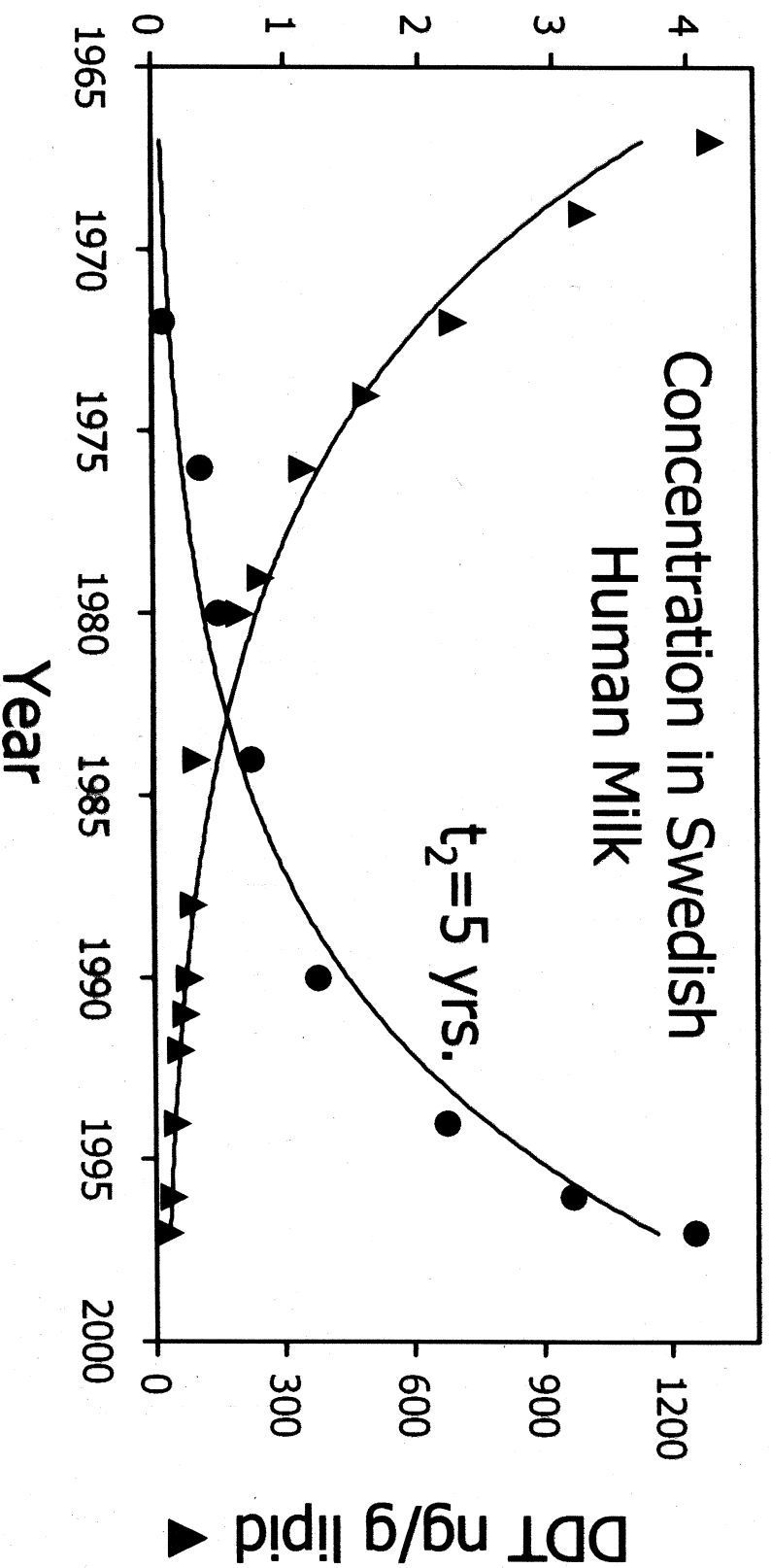
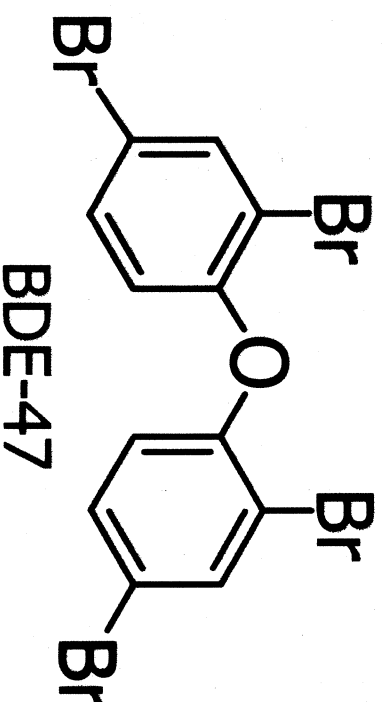
School of Public and Environmental Affairs
Indiana University



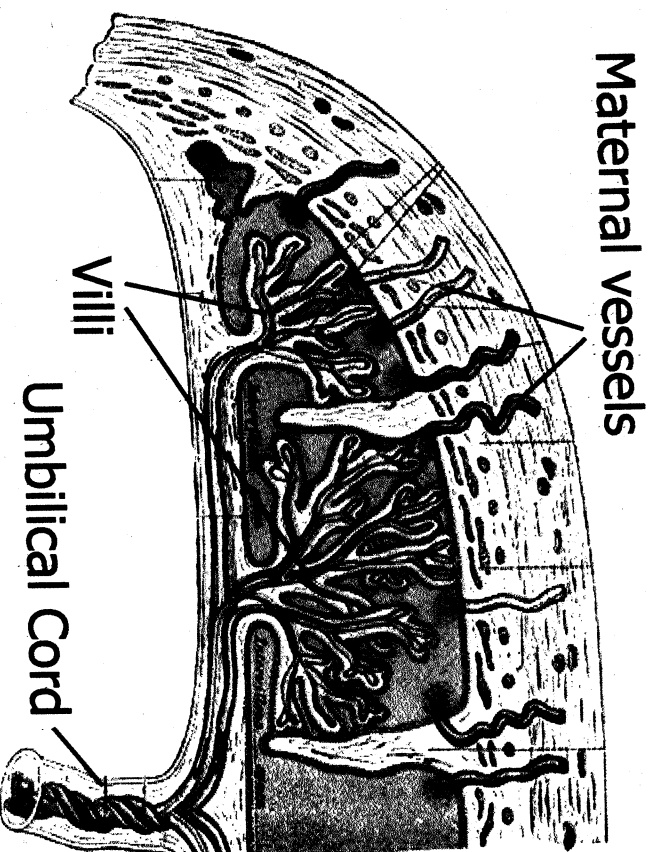
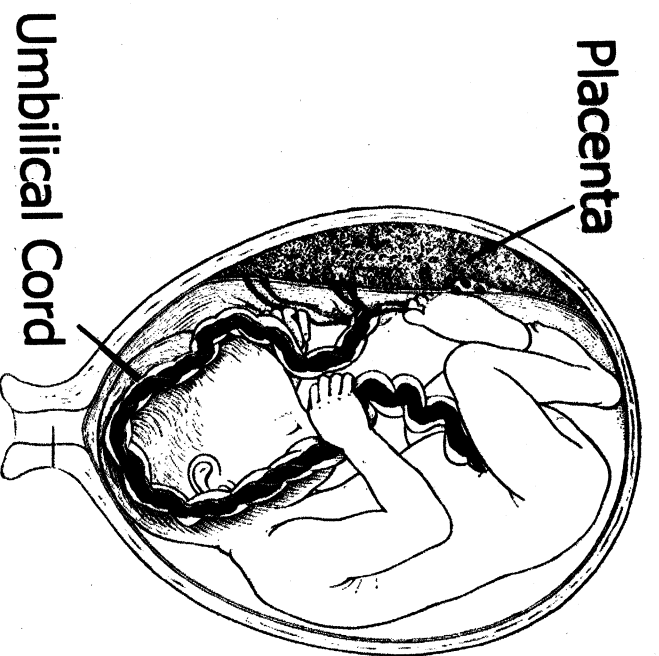
Polybrominated Diphenyl Ethers



Br_{n=1 to 10}

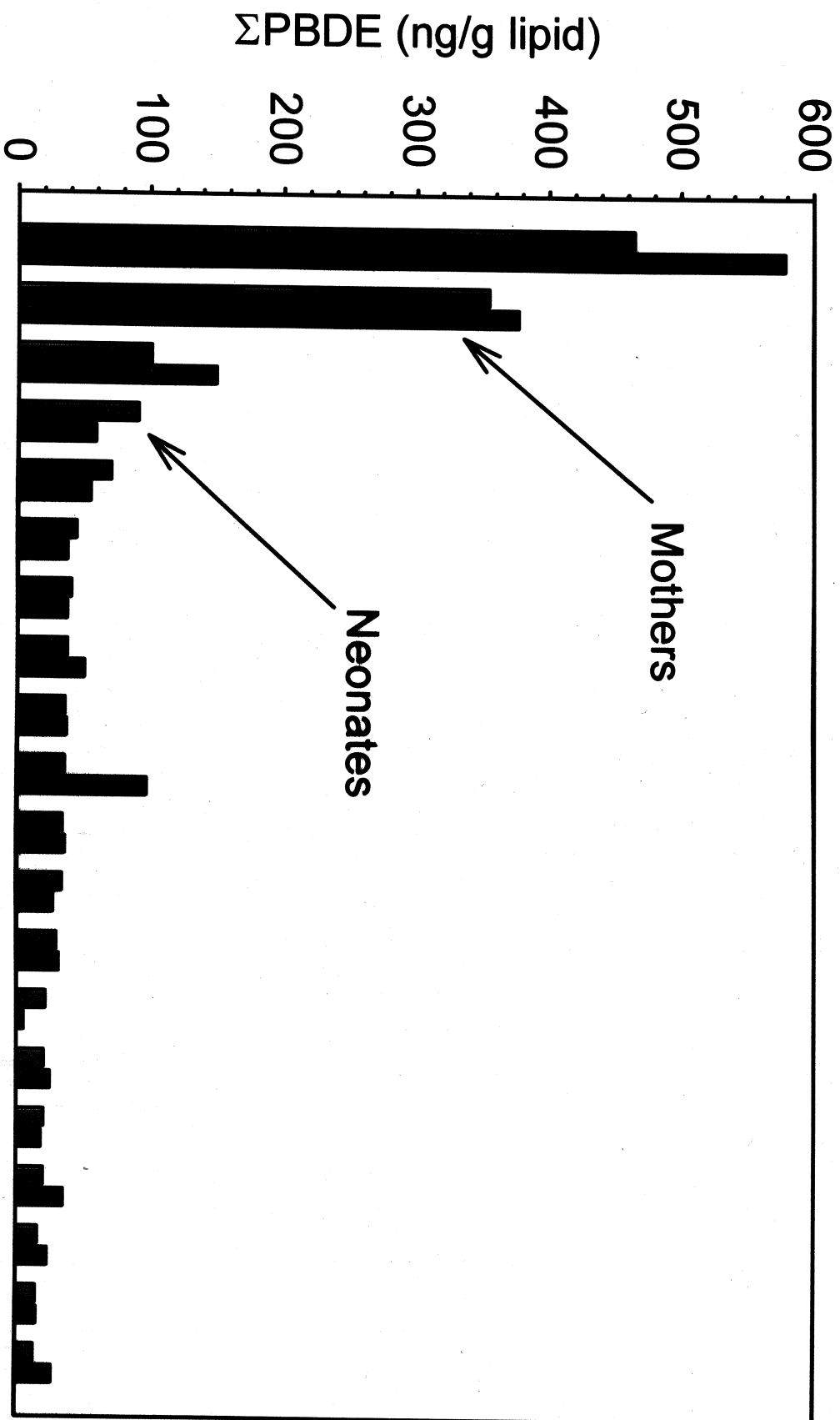


PBDE in Human Maternal and Umbilical Cord Blood

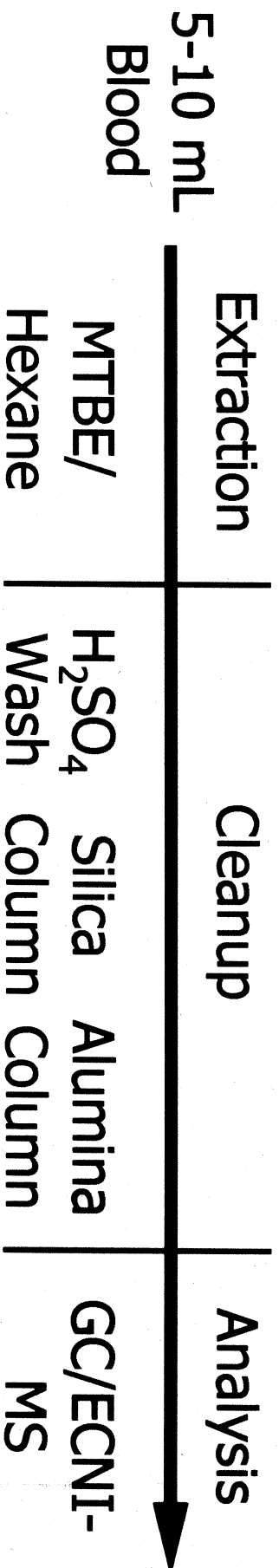


- Sampling Scheme: Paired mother-cord blood samples taken randomly at Indianapolis hospitals.
- Goals:
 1. Find the range of PBDE levels.
 2. Find the extent of placental transfer.
 3. Correlate PBDE levels with environmental factors and health indices.

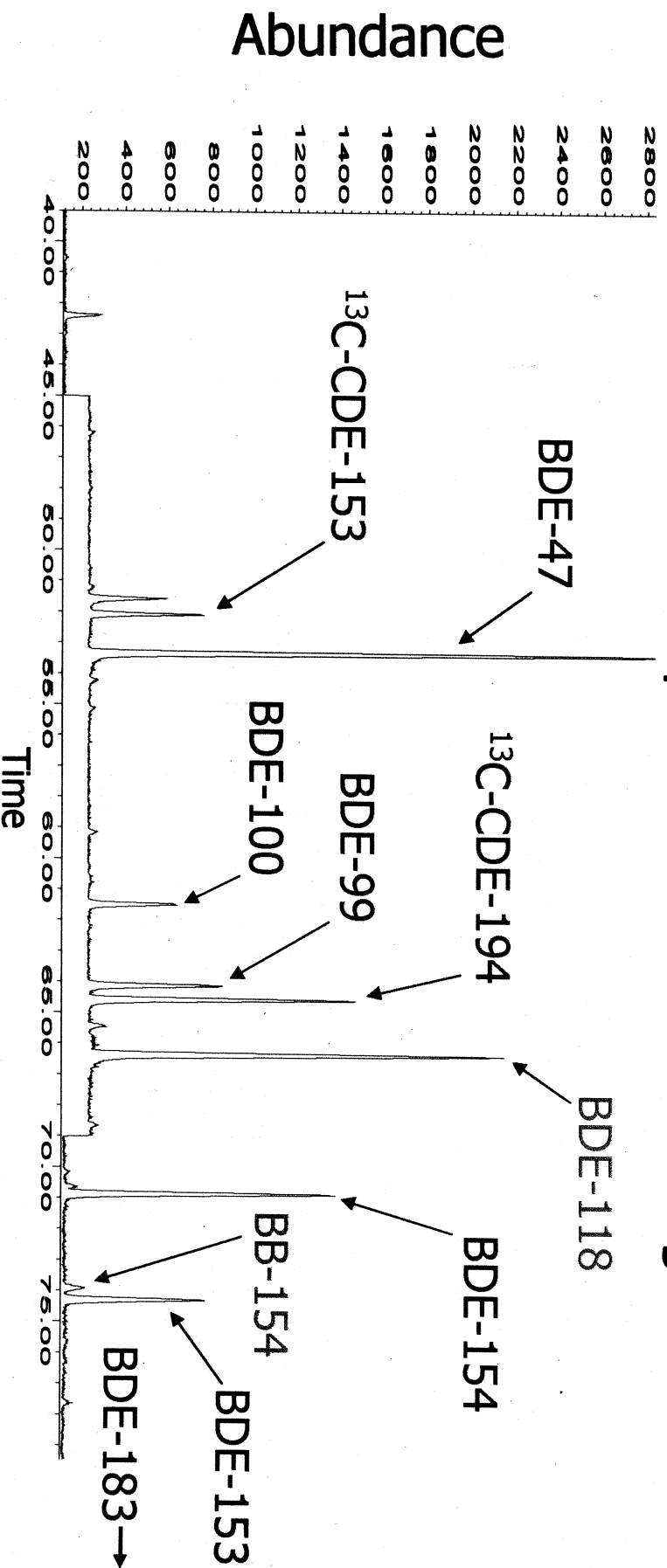
Total PBDE in Indianapolis neonates and their mothers, 2001



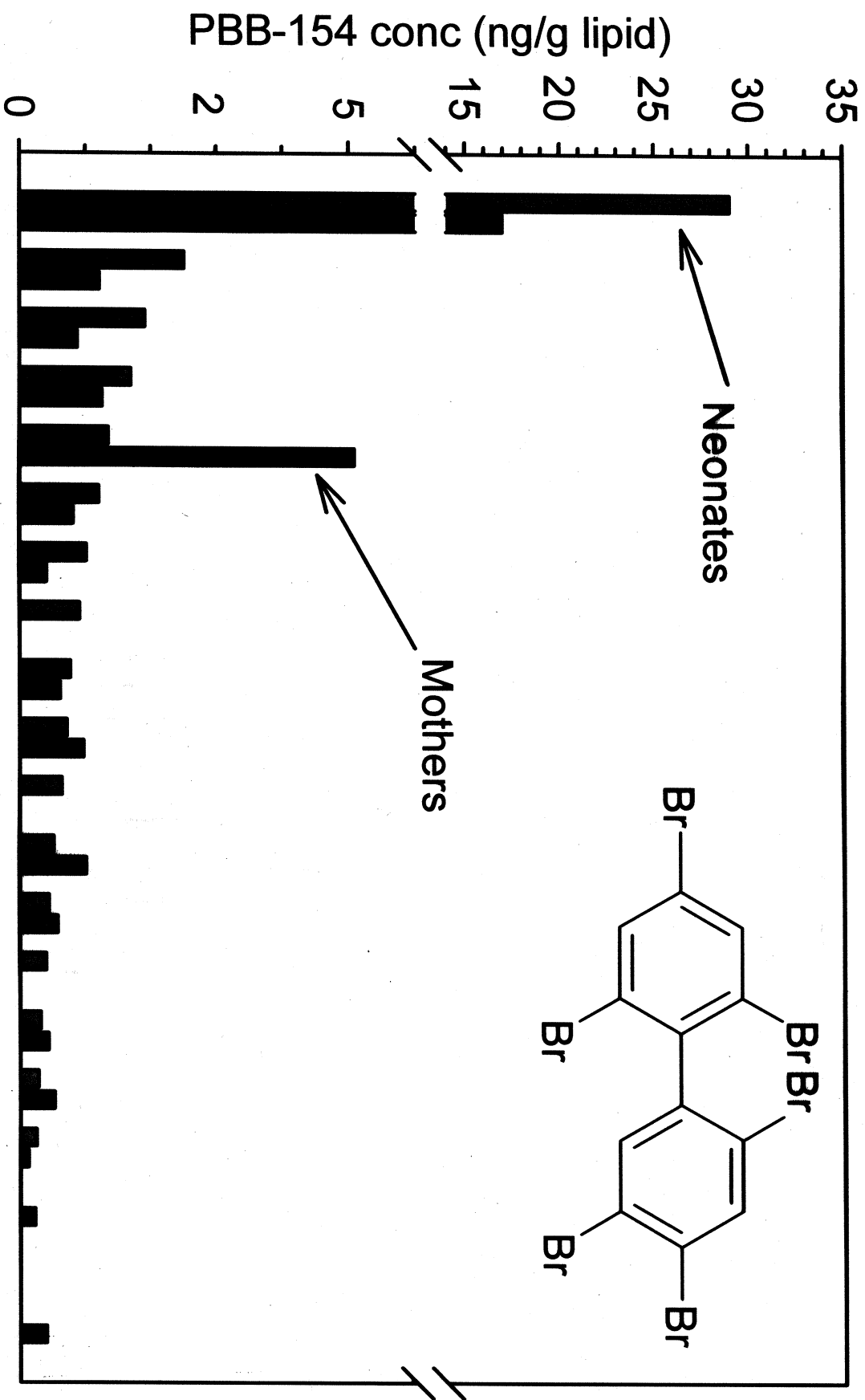
Analytical Method



Cord Blood Sample Total Ion Chromatogram



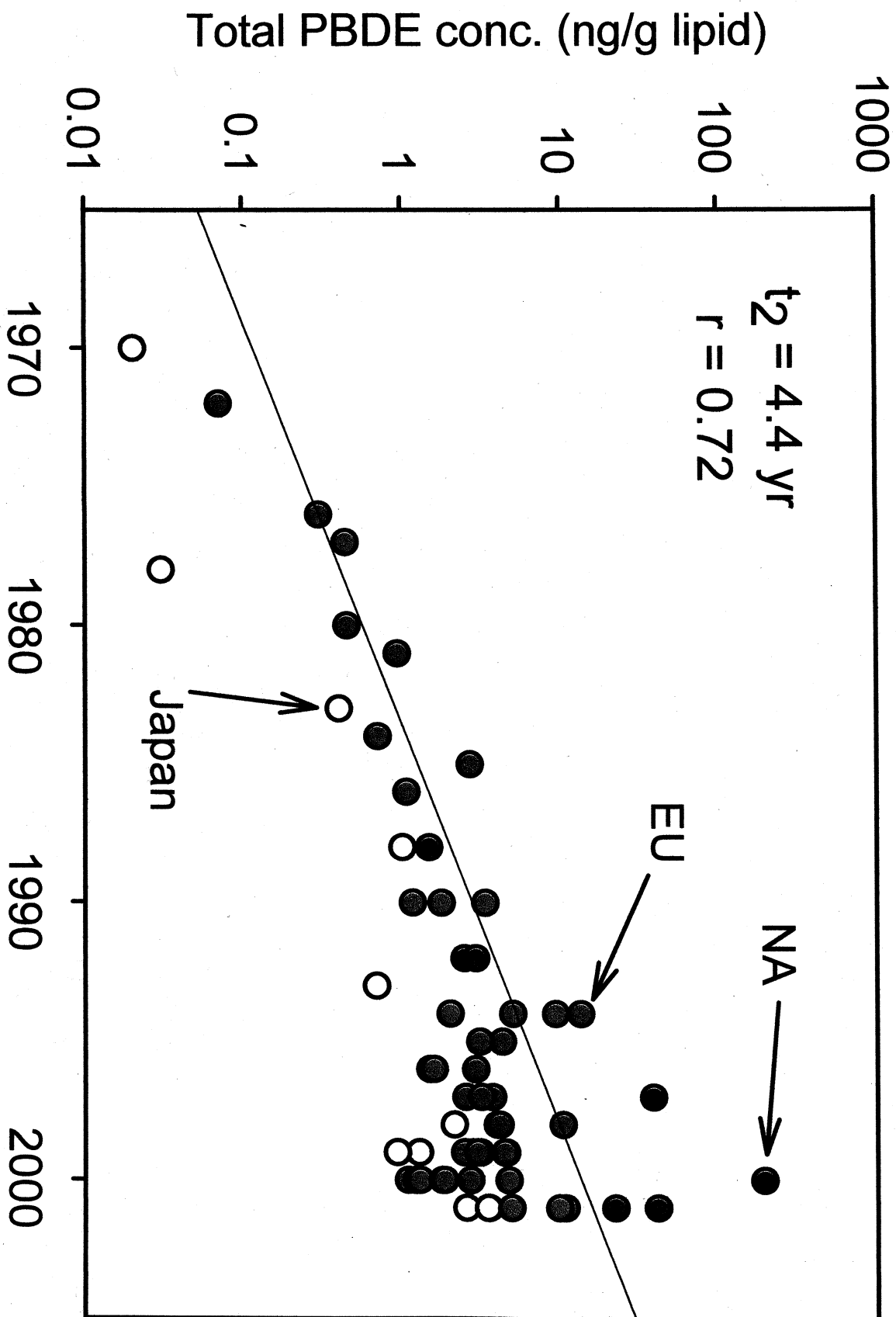
PBB-154 in Indianapolis neonates and their mothers, 2001



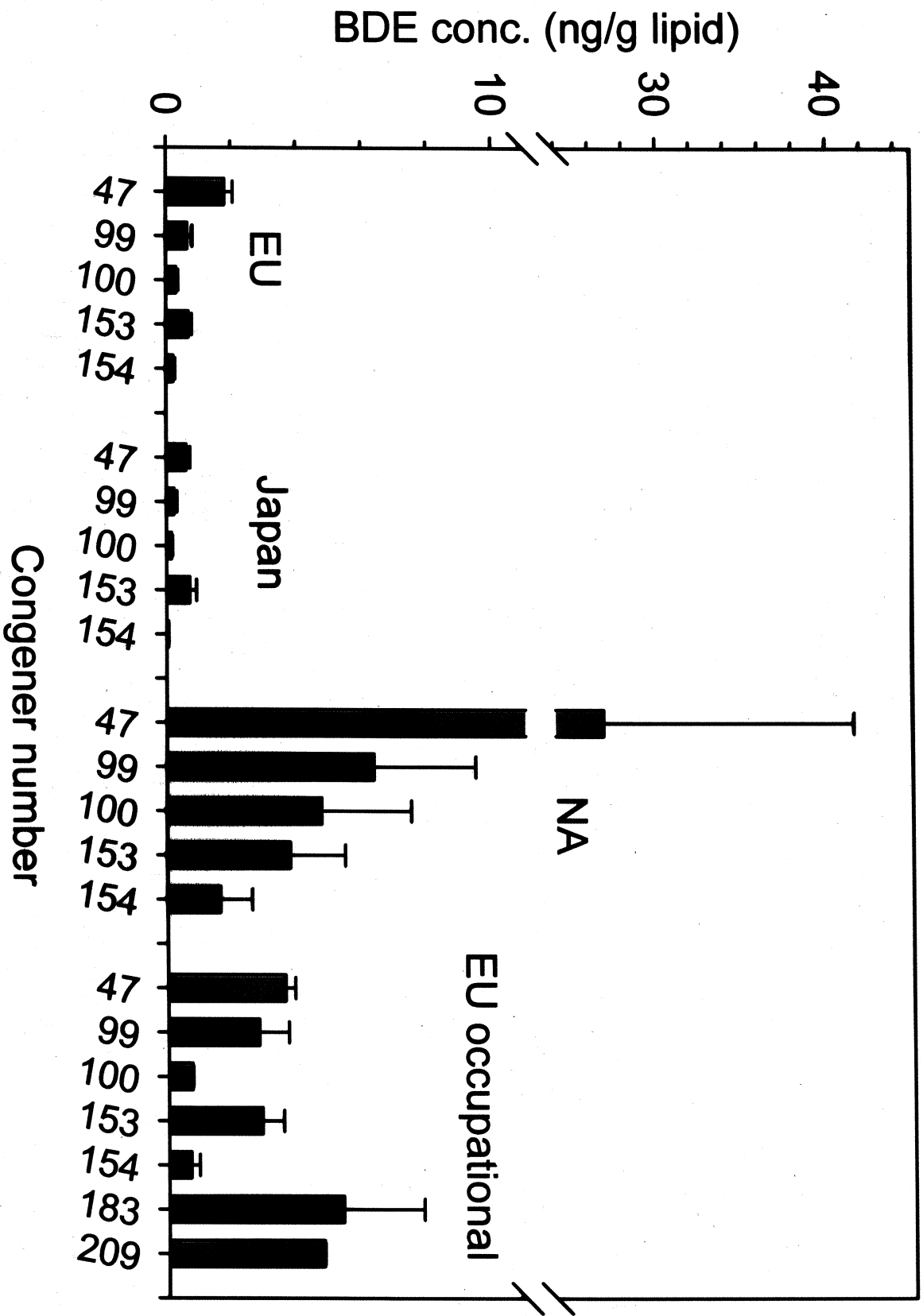
Here is what I did:

- A full literature search on PBDE in people and the environment
- Tabulated all concentration data by congener, omitting papers that did not report congener specific data – *caution*, not all papers reported or measured the same set of congeners
- Sorted out papers that focused on human samples (blood, milk, tissue)
- Noted the year(s) the samples were taken (if not given, this was assumed to be 1.5 years before the publication date)
- Ambient samples: 41 data sets from Europe (mostly from Sweden), 14 from Japan, and 9 from North America
- Occupational samples: 12 data sets from Sweden and Norway (dismantlers and some “controls”)
- Organized data by time when sample was taken
- Calculated totals, averages, and congener distribution by %

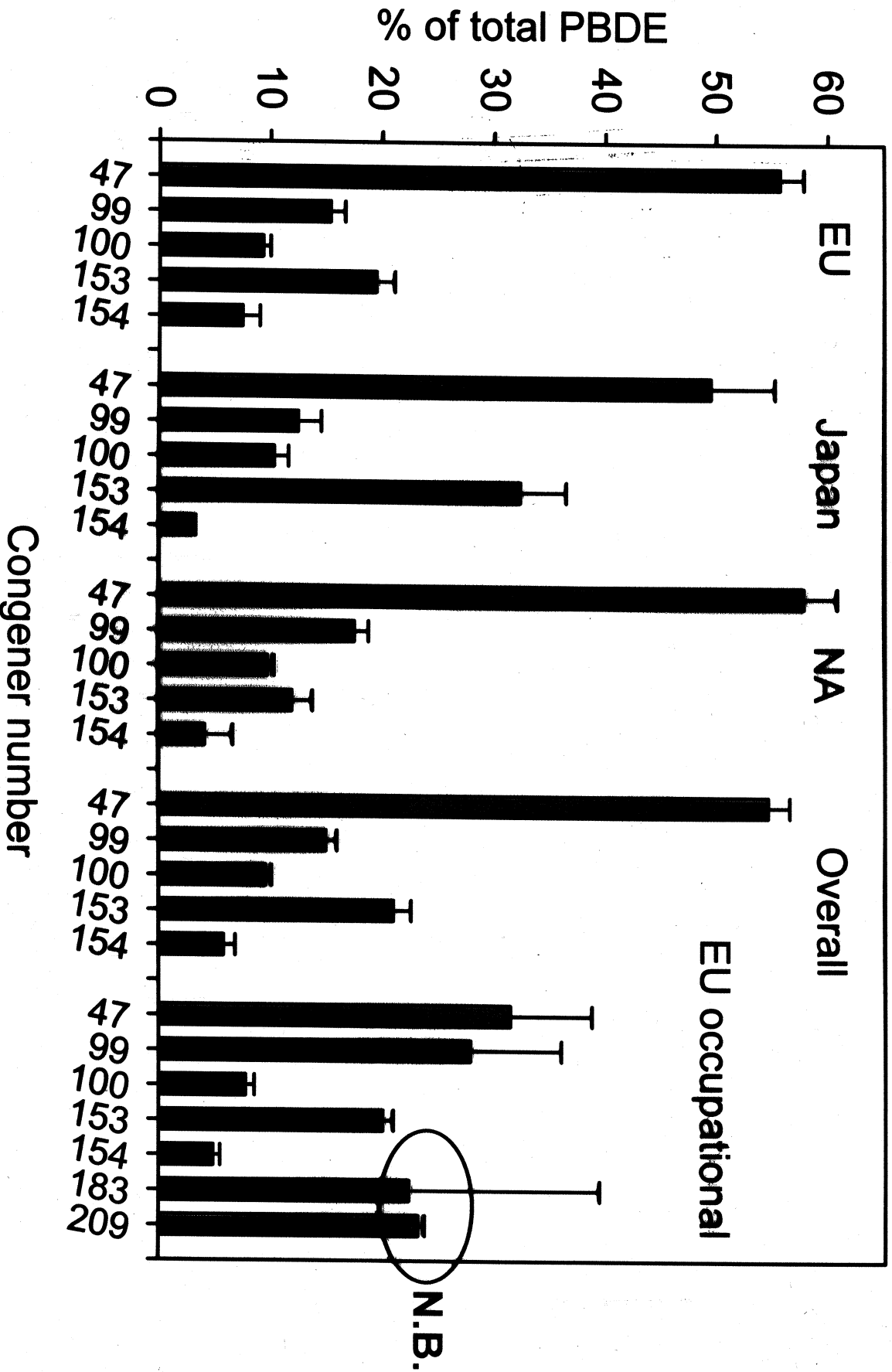
Ambient human blood, milk, and tissue



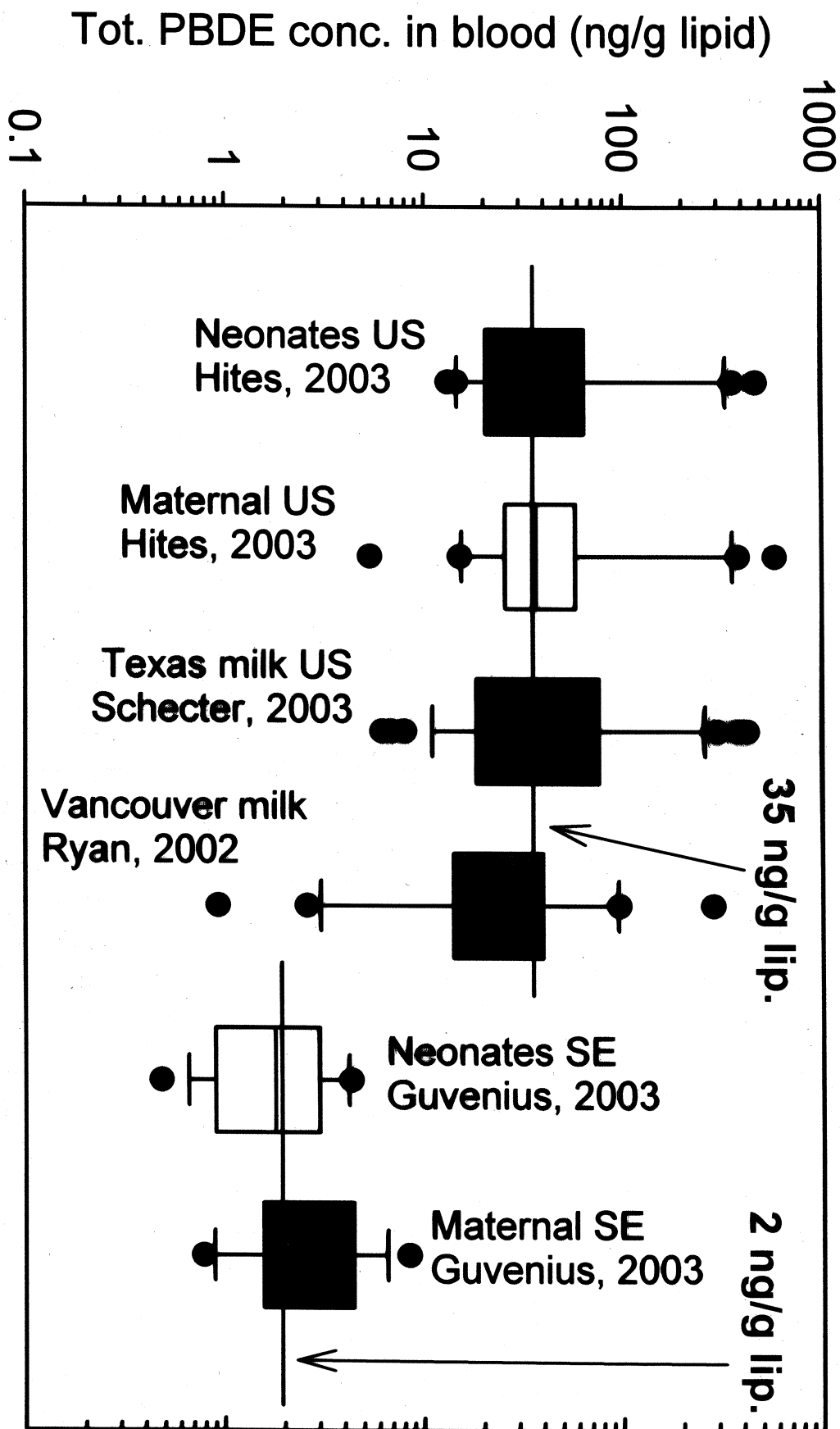
PBDE congener conc. distributions in human samples



Congener patterns in human samples



PBDE conc. in recent human samples from N. America & Sweden





Major Brominated Flame Retardants Volume Estimates

Total Market Demand By Region in 2001

[MT]	Americas	Europe	Asia	Rest of World	Total
TBPA	18,000	11,600	89,400	600	119,700
HBCD	2,800	9,500	3,900	500	16,700
Deca-BDE (DBDPO)	24,500	7,600	23,000	1,050	56,100
Octa-BDE (OBDPO)	1,500	610	1,500	180	3,790
Penta-BDE (PBDPO)	7,100 95%	150	150	100	7,500

21 January 2003

Some Conclusions & Recommendations

- PBDE levels are 10-20 times higher in people from North America than in Europeans (or at least Swedes). Levels in Japan seem to be about half of those in Europe.
- This finding is consistent with the market for the Penta-BDE product, 95% of which is used in North America.
- Levels in people all over the world seem to be exponentially increasing with a doubling time of 4-5 years.
- The congener pattern is dominated, especially in North America, by BDE-47; occupational samples also show BDE-183 and 209.
- In the future, measure all congeners all of the time
- PBDEs cross the placental barrier -- but are there any effects?
- The range of concentrations is wide -- what accounts for the high outliers?
- Begin a regular program of annual monitoring of PBDE (at least) in people, in selected food, and in Great Lakes' fishes.
- Don't forget about the polybrominated biphenyls (PBBs).